

AMERICA AT WORK

JOSEPH HUSBAND



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By Joseph Husband

AMERICA AT WORK. With frontispiece.

A YEAR IN A COAL MINE. With frontispiece.

HOUGHTON MIFFLIN COMPANY

BOSTON AND NEW YORK

AMERICA AT WORK



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BY

JOSEPH HUSBAND

76



BOSTON AND NEW YORK
HOUGHTON MIFFLIN COMPANY

The Riverside Press Cambridge

1915

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Published November 1915

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TO
THAT BEST OF FRIENDS
CHARLES TOWNSEND COPELAND

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AMERICA AT WORK

I

SEMAPHORE

EVERY night, at exactly eight minutes past nine, the limited roars through the village. I can see it coming several miles away, its powerful headlight fingering rails and telegraph wires with a shimmer of light. Silently and slowly it seems to draw nearer; then suddenly, it is almost above me. A wild roar of steam and driving wheels, the wail of its hoarse whistle at the crossing, and then, looming black against the night sky, it smashes past, and in the swing of drivers and connecting rods I think of a greyhound, or a racehorse thundering the final stretch. High in the cab window a motionless figure peers ahead into the

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night; suddenly he is blackly silhouetted by the glare of the opened fire-door, and in the orange light I can see the fireman swing back and forth as he feeds his fire. The light burns against the flying steam and smoke above; then blackness — and now the white windows of the Pullmans flicker past, and through the swirl of dust and smoke I watch the two red lights sink down the track.

Every time I see that black figure in the cab I wonder how far he can peer ahead into the night, and I wonder at the perfect faith that is his: faith in silent men who keep the semaphores lighted and true, and in those humble servants whose constant watchfulness guards him from broken rail and loosened fish-plate. Last night I sat beside him.

It was not my limited that I boarded, but a faster, greater engine that helps to rush

SEMAPHORE

half across the continent a train before which all others wait and all tracks are cleared. I stood with the division superintendent on the platform of the little station where it must pause for water. Beyond the yardlights its song rose clear and vibrant. With a flare of lofty headlight and the grind of brakes it was beside us, steel lungs panting heavily, a reek of oil sweating from heated sides.

The engineer, a torch in his hand, swung down, and we shook hands before I climbed the iron rungs to the cab. From the high windows I watched him oil and stroke the sinews of his monster. Behind, on the top of the tender, the fireman was filling the tanks with a torrent of water. Then they joined me, and in the torchlight I saw the black studded end of the boiler, like a giant cask-head, a tangle of pipes across its face; water-gauge and steam dial dimly il-

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lumined by shaded bulls-eyes. The engineer blew out the torch and climbed into his seat. Opposite him, I settled into mine, the fireman behind me.

There was the thin piping of a whistle in the cab and the engineer slowly opened the throttle. We were off. Rumbling and swaying, we passed the upper windows of the station. Telegraphers in shirtsleeves were fingering their instruments beneath shaded lights. The chill of the frosty night air penetrated the cab, and I buttoned my coat about me and looked ahead into the darkness. We were gathering headway. A string of freight cars on a siding swept behind us; already the lights of the village were far behind. Ahead of the long body of the locomotive, extending incredibly beyond the small front windows of the cab, the track, hardly visible in the ray of the headlight, terminated suddenly in the dark-

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ness. The roar of drivers and machinery was deafening. From side to side the engine rocked like a plunging derelict. The crashing roar grew louder, loud beyond belief, and the rocking and trembling almost threw me from the seat.

The fireman slid open the jaws of the fire-box, flooding the cab with light and heat. Within, the flame, white to pale daffodil in its intensity, twisted like streams of fluid in the draught. Behind the cab the black end of the tender rose high above my line of vision, rocking and swaying in contrary motion to the engine, like a bulldog twisting on a stick. Balancing on the smooth steel floor, the fireman stoked his grate-bars, his shovel feeding spots where the coal was thinnest. Then darkness as he closed the doors with his foot. Only the two dim lights on gauge and indicator; and on each side, and above, the stars racing evenly

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beside us. I looked down at the road-bed: it was flooding past us like a torrent.

“Green.” I caught the word above the tumult.

“Green,” echoed the fireman.

Far ahead, four colored lights gleamed like gems against the sky. Two rubies below; above, another ruby and beside it the pale green of an emerald. The green light was in the upper right-hand corner of the square.

“Seventy-five to eighty.” The fireman shouted in my ear.

“Block’s clear. That green light gives us a clear track.”

Already the block semaphores were behind us. Blinded by the rush of air I tried to see the track ahead. Like a dark avalanche the world seemed pouring under our pilot, and beneath I felt the road-bed, at last in motion, shivering and swirling like a mill-race. From under the engine puffs of

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steam shredded into fog-rift, white in the light from the round holes beneath the grate-bars. And through the two great circles of light projected by them, as from a stereopticon, flickered embankments, telegraph-poles, hills and houses, like a reeling cinematograph.

“Green.”

“Green,” came the confirmation.

The fixed green star shone for a minute and flashed past.

Faintly I heard the fireman at my ear.

“Almost ninety.”

Long ago the headlight had become useless except as a warning of our approach; we were past the farthest range of its illumination before the eye could discern what lay before us. Blind and helpless we tore on. Broken rail, a train on the crossing, or open switch, — we would never see it. But “green” shone the light, and wholly trust-

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ing in the silent men who flashed to us their word of safety we never faltered. I thought of a stalled train that might lie sleeping on our rails. But "green" was the light,—their thin cry through the long night watches.

The engineer, silent, his hand fingering throttle and air-brake, sat huddled high on his seat. Through his goggles he watched the blackness ahead. A brief second's time to set his brakes was all he asked. Far off in the great city the chief dispatcher was following our flight mile by mile, block to block. Over the wires his voice and the voices of his helpers told the rapid story of our progress. In the lonely tower at the next curve some one would flash the green beacon to our straining eyes, and report us on our way. To him others were now reporting, giving him the certain knowledge that our way was safe. Keepers of the

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safety of our path; how perfectly we trusted them; how great and unrewarded is their perfect service.

I looked back. Behind, the Pullmans cast steady squares of light on the racing cut. Here was our freight. Sons of Mary; even more blindly they trusted, "peacefully sleeping and unaware."

Sons of Martha; they were beside me.

"Green," they chorused.

Out of the night came the instant crash of the westbound express. With a blast of air and a slamming roar it seemed to brush us. It was gone.

Through a sleeping village we tore on with a wild hoarse cry. Darkened windows flashed reflected light. A station platform whipped past our heels; huddled groups of people pressed back against the building.

"Green!"

Like brilliant stars from a rocket gleamed

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a constellation at a double crossing. Ruby drops of fire; but the pale green light shone steadily above. The wheels hammered on the crossing.

Thicker and thicker, like colored fire-flies, the switchlights tangled in a maze. We were entering the city. There was the constant rattle of switch points, and I felt the growing murmur of the streets. On either side buildings piled up in shapeless walls like a canyon; there were sudden glimpses of interrupted streets, waiting street cars, and the glare of arc lights. We were slowing down.

Cleveland. The station echoed with the iron coughing of engines. Men and women surged between waiting trains; their voices mingled in the uproar. The departing, the returning; men staggering with bags and suitcases, women with little children in their arms. In the green star they trusted.

II

THE NARROW HOUSE

THERE is a gardener in a little Massachusetts village who for a long lifetime has devoted himself to the culture of roses; my friend in Elmira has cases upon cases of beautifully mounted butterflies, for fifteen years he has studied and collected them; both have become authorities, and so also has Wheelan, for the past twenty years a maker of caskets.

Casket factories, no matter what we may feel to the contrary, are quite like any other manufacturing business that daily places its orders with a hundred different houses for its materials and supplies; and so it was not curiosity that first took me there, but business, and on a business basis my ac-

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quaintance with Wheelan was begun. In the street some boys were playing a noisy game and on an opposite corner a new house was building. I opened the heavy factory door and entered the dusty little office of the superintendent. Fine wood dust filled the air, and dust in a smooth, flourlike coating lay on the desk and the shelves. Wheelan was checking invoices and nodded to me between figures. I sat down on a chair by the door and waited. Tall, thin, stoop-shouldered, hands hard and twisted with labor; there is nothing distinctive about him except the pleasant blue eyes and a thin-set wrinkle or two about the small mouth, that mean perhaps a lingering sympathy with humor, perhaps a simple kindliness.

“Do you want to go through the factory?” he finally asked me, when business was done. I did and I did not, but I nodded

THE NARROW HOUSE

and my acquiescence seemed to please him.

The great main floor was cluttered with machinery, and the ceiling writhed, a waving jungle of circling belts. The air was heavy with the dry, pungent smell of oak, streaked almost visibly, it seemed, with an occasional clean breath of fragrant cedar. Conversation was impossible above the screaming of the saws and the splintering stridor of the planers. Everywhere were trucks, high with piles of lumber, moving endlessly on through the great room, and all of the oak planks were cut to one or two general lengths: there were short ones, and there was a size that seemed about six feet, more or less. In the rear of the woodworking room I stopped for a minute, and, absorbed in the fascination of the thousand flying wheels and the perfect order and the system, forgot the need which created it.

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Up in the comparative quiet of the second floor the piles of boards were taking shape. With the speed of long practice fifty hands glued, nailed, and fitted, and everywhere against the walls and between the work-tables stood shallow oak and cedar boxes. How many there were! And yet, each day a hundred were trundled into waiting freight cars.

There was a smell of paint and varnish in the next rooms. Piled high against the walls were a thousand little boxes. How brief is life! With broad brushes the painters spread the smooth, white paint. How very small were they of the great pile in the corner.

"Something pretty swell in Circassian walnut," said Wheelan; "and those, they're real mahogany, the genuine, solid stuff."

He patted the sleek side of a great chest. "First-class piano finish. That's my own

THE NARROW HOUSE

design, those there, side lets down and makes a divan — two pillows to match. Looks real natural-like.”

I looked inside the unfinished case.

“No, there is n’t any finish there. No one sees that. We leave the bottoms and the insides rough.”

Beyond, in the temporary storerooms, were hundreds of long boxes of various shapes and colors, piled one above the other in rows, like canoes in a boathouse.

“That natural-shaped kind,” Wheelan said, pointing to a great section filled with the traditional-shaped coffins, all painted a lustrous imitation black walnut, “that’s the kind the soldiers and sailors use. Farmers like ’em, too — we ship lots up to Minnesota and the Dakotas.”

“Cheap, too,” he continued, “but those fine wood ones, they’re my real delight. I’ve got up three original designs myself —

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all turned out popular, too. Why, Richard Hippin, you know the name, of course, used that style X5 with the hand-carved claw feet."

"How long will they last, those cheap ones?" Then, almost before I finished my question, I suddenly realized how completely a long-cherished belief had been torn from me, and a new realization as instantly replaced it. A few months, or a few years, what did it matter.

"Oh, the best of them go pretty quick, I suppose. Them? Well, a year. But they're not put so well together. These swell ones ought to last for five or perhaps ten years. Then, if there's a copper lining —"

I moved away to look at an oak box, elaborately carved and stained a shiny, brilliant green. It is a very familiar finish, but I could think only of the chairs and tables on a hotel roof-garden, where there

THE NARROW HOUSE

is a gay little orchestra that is still playing, no matter how late you stay. They are finished in the same stain.

At the end of a long high room ten young women were sewing white lilies of the valley on filmy shrouds. Outside there was sunshine and the noise of the street; they looked up when we entered, smiling and chatting over their work. They were very gay and their eyes seemed filled with thoughts far away from white silk and shapeless garments.

A man was gluing a strip of thick, black cloth on the side of a casket, smoothing it until there was no crease, then heating it with a jet of puffy steam to give it a gloss.

"How's that for style?" said Wheelan. "It's so dignified and yet it ain't cheap-looking, even if it is sort of plain. Put on silver handles and a nice plate and you get

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something that goes into the very best houses."

Satin and fine cloth were the linings, but beneath the rich textures the workmen were stuffing excelsior. A young woman with a mountainous plenitude of immaculate saffron hair was tacking gimp along the edges. She was whistling a snatch from "The Chocolate Soldier."

Down again, on a lower floor, the carefully wrapped caskets were being cased in the familiar rough boxes.

"It's nice work," said Wheelan, "and there's always a chance to make improvements. Of course there are regular lines you have to follow, but if a man's got his heart in the work, he can show himself."

It was a long walk to the car, and on the way I thought of an Eastern legend that I once heard. It told of a wise and godly man, who, in a vision, saw himself sitting on the

THE NARROW HOUSE

highest peak of the Himalayas. An angel, descending, touched the peak with his wing and a single grain of sand fell into the abyss below. "Once in a thousand years," said the angel, "I brush a grain of sand from this lofty peak. In time I will level it to the plain, — and yet eternity is but begun." And then I thought of another who said so simply: "All is vanity."

III

VULCAN

TEN years ago, the low dunes, a desert of yellow sand and beach-grass, stretched unbroken from the foot of Lake Michigan south to the headwaters of the Kankakee. Since the early days when the good Father Marquette was paddled slowly around the curving beach line to die finally on the Michigan shore, they have remained — a desert of soft colors in the summer, a sleet-swept tract in winter. A few miles north, on the western edge of the lake, a vast city, in a single century, was born and thrust its towers high against the horizon. Then, suddenly, came an instant transformation. Other cities, filled with the men of every nation, flattened the dunes into

VULCAN

level streets. Along the lake shore strange structures of steel, reeking with smoke and blackness, streaked the sky with a cloud by day and a glare of furnaces by night. From a hundred meshing tracks the clamor of locomotives rose above the murmur of the city's streets. Steel, Vulcan, had usurped the wastes of sand and wiry beach-grass. Progress and industry stained the blue Indiana sky with the smoke of a thousand chimneys.

The long concrete slip slashed the beach lines. Beyond its mouth the lake, a brilliant ultramarine, pounded in before the north wind; but inside, the quiet water was tawny with riled sand and the stain of iron. Against the nearest dock an ore steamer rested its long, low body beneath the shadow of a steel trestle that reached out, far above it. With sudden motion a grab-bucket swung down on slender cables from

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the trestle and disappeared in the waist of the ship. In an instant it lifted on tightened cables, heavy with ore, and swung ashore with grinding vibration of wheels and electric motors, to drop its contents on the ore pile that ran parallel with the dock. Like a mountain range the vermilion peaks of ore piled up above me, from the mouth of the harbor far inland, so high that behind them only the tops of the tallest furnaces appeared against the sky. From the scarred hills of northern Minnesota, down the length of Lake Superior and Lake Michigan, other steamers were bringing fresh food for the hungry furnaces. The reverberation of the mills rose sharp above the even cadence of the surf.

Like strange Martian creatures the blast furnaces squatted beyond the ore piles. Ample-waisted, they flanked them, and between their huge structures the long row

VULCAN

of "stoves," high as modest skyscrapers, lifted their slender domes in even line. Beyond, a vast pile of coal reared black against white heaps of broken limestone.

Inside the steel structure which inclosed the furnace a score of blackened, half-naked men were moulding huge troughs of sand to receive the surplus iron which would pour forth when later they "cast the furnace." Hot, and enormous in girth, the furnace filled the building. Inside, under forced draught, and at a temperature of thirty-five hundred degrees, layers of coke, limestone, and iron ore were undergoing their vital transformation. By the heat of the consuming coke the iron was filtering down in liquid flood, purified and refined by the flux of melted limestone.

From beneath the furnace a squat locomotive dragged a string of curious cars across a desolate field to the steel mills.

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On low trucks the ladles, like inverted cones, carried the liquid metal, — so hot that four hours might elapse before it solidified.

In the twilight of a long corrugated building the brick ovens of the open hearths stretched away into almost indefinable distance. Heat, fresh consuming heat, choked the air. And from chinks in the hearths a white light of indescribable intensity pierced my eyeballs.

The trainload of molten metal had arrived before us. Already a big-lipped ladle had been dragged by an electric engine into the gloom of the building, and up to the hearth-mouth.

The doors of the hearth were thrown suddenly open. A blinding whiteness streaked with saffron, and heat almost beyond endurance, made me draw back behind a column. A workman thrust a pair

VULCAN

of deep-blue glasses in my hand. Slowly the great ladle bent forward. From its spout a trickle of fluid iron poured faster and faster until the white cascade, at full flood, seethed into the hearth-bath. A shower of sparks, strange flowery pyrotechnics, shot high into the gloom. Through the blue glass I peered into the hearth. Like an infernal lake it swirled and eddied, a whirlpool of incandescent flame. Leaping tongues of pink and lavender danced in the blue darkness. Shielding their goggled faces from the heat, the workmen cast lumps of rich ore into the hearth-mouth,—black silhouettes of men against the blue glare of an uncanny firelight.

Behind the long row of open hearths huge cranes rumbled back and forth on their tracks beneath the roof, the operators, concealed somewhere on their rivet-studded frames, directing the swinging cables that

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lifted and carried weights inconceivable. High in the dark vault a great crane swung over us.

“They’re going to tap a heat,” shouted the assistant superintendent in my ear, his words sounding faint and fragmentary above the steady roar that filled the building.

On the floor below, an electric motor trundled an empty ladle into place beneath the rear of one of the hearths.

Then from the hearth, with a mad daze of brilliancy, fifty-six tons of molten steel began to disgorge itself. Once more I put on the blue glasses. Against the deep purple gloom of the building the stream of metal shot forward and bent in the soft curve of running water. Like pale moonbeams the sunlight rays from glassless windows pierced the darkness, and sharp across them leaped the avalanche of steel, a flood of brilliant

VULCAN

pink and blue that showered the room with a constellation of falling stars.

For a brief minute I took off the glasses. In the terrible glare of light all background disappeared. Gone were the dark shapes of the toilers beneath; gone the uncanny moonlight. Yellow, tawny, brilliant as the contact of an electric arc, the swirling metal scorched my vision. A halo of flame seemed to envelop the ladle.

It was full. Through the glass, again, it boiled soapy and seething, the crest of its wave-tossed surface crimson and blue. Slowly from the crane above, two great hooks, like bent fingers, caught the handles on its sides, lifted it, and with a hail of sparks and a glare of heat against our faces, swung it far above us. Then, with grinding reverberation, it moved past, far down the long gallery, to be poured into ingots in the waiting moulds.

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In the "blooming mill" there was the continuous rumble of mighty thunder. Cherry-red against the darkness, the incandescent ingots of steel shot back and forth between giant fingers that pressed and worked them at every passing; for like dough that must be kneaded to acquire a certain consistency, steel must be worked to obtain those qualities which its ultimate purpose will demand.

Into a great plank a hundred feet long the solid ingot flattened resistlessly between the stroking rollers. Then, finished, it shot abruptly beneath a knife that snipped it lightly into even bars of manageable weight.

In the structural mill the billets of steel, still malleable with glowing heat, rumbled noisily back and forth on the metal floor, propelled invisibly by countless whirling rollers that shot them with incredible speed

VULCAN

and certainty of direction. As I looked down the length of the gloomy building, the glare of the moving bars of metal contrasted so sharply with the black floor that they alone were visible, like strange illuminated bodies that floated and swam on a sea of inky water. Through devious channels they navigated, palpably changing, narrowing, lengthening, until at last, in the far end of the building, the finished angle-bar or I-beam was deposited, a perfect thing, of cooling lead-gray steel.

And still more buildings; parallel with each other; equally vast; filled with darkness and tumult, the shifting shapes of giant roof-hung cranes, and the red glow of heated metal. Like paste from a tube, a thin rope of white-hot steel emerged from a shapeless machine that crouched squat on the iron floor, and with a breath of heat disappeared in the breast of another mon-

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ster that trembled with the reverberation of a hundred hammers. And faster than the hand of my watch could count the seconds, a hail of railroad spikes, still glowing, leaped finished from its thundering womb. Bolts, spikes, nuts, and rivets, madly, with the tumult of clashing steel, poured finished from the vitals of the uncouth machines.

Plates of steel for the flanks of ships which will some day transport the wares of a trading world. Rails and spikes to carry high over mountain passes the flitting trains that make distant cities one. Bolt, rivet, and girder for the towering building. Steel, steel for its multifold destinies, here it is born in heat and labor. Steel for an age of steel.

In the twilight of the late summer afternoon the world seemed strangely quiet and at peace. Sharp and black against the yellow sky the roofs and stacks of the mills

VULCAN

rose like the sky-line of a ruined city; and in an occasional opening the blue lake gleamed with the brilliant light of sapphire. In the gathering darkness electric lights began to glimmer. Flares of dull-red gas-flame burst out like volcanoes and suddenly were gone.

Loud and metallic a hurdy-gurdy lifted the rippling cadence of a Neapolitan air in a distant street. Beyond the mill-yard gates the saloon windows shone gayly and arc lights trembled into life. Day was over.

IV

LEVIATHAN

A COLD northeast wind had come up from the sea, and before it the fog was flying in great, torn clouds of mist, like rifted smoke. Above the deck of the yacht it billowed past the thin slant masts, and at times, when it opened a little, the sun, a pale yellow disk, shone weakly for a minute until another gust of fog closed in before it. Aft, the propellers combed out on the pitching green surface of the sea a channel of soapy white, that ended not many yards astern, where fog and water met.

I was standing on the forward deck, my face dripping with moisture and a thousand little beads of mist clinging like dew to my clothes. The air was heavy with the smell

[LEVIATHAN

of green salt water, borne strong on the rising breeze, and the smell of the ship, that indefinable blend of odors exhaled from cabin, galley, and engine-room. From below decks came the murmur of the engines, and from beneath the bows, where her sharp prow carried a white bone in its teeth, the noise of rushing water was flung back on the wind. Aft, in the shelter of the deck-houses, a white-jacketed Japanese was passing sandwiches to the ladies.

The first mate, who stood beside me, peered up into the fog.

"Rotting out a bit," he said; "guess there's a chance it'll burn off by noon. Won't see much of the launching if it don't."

As he spoke, there was a sudden gap in the flying mist and from a square of blue the sun shone brightly for a minute. From the port bow came the soft, low tolling of a bell buoy, and as the fog grew weaker it seemed

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to start toward us out of the mist, a swinging tripod of blackened iron, the water swashing and surging on its circular base as it careened in the heaving sea. As the yacht cut past it, the bell for an instant struck loud and clear, and then grew faint and was gone as we swept it far behind.

An hour later the fog had lifted and the last white shreds were flying inland over the hills. From the open sea the wind came cold and clear, and under the brilliant sunlight the water sparkled a vivid blue, broken by bands of green. On our starboard side the coast-line pressed out against the water, rocks and the green of trees dark against the pale horizon. In a sweeping curve the yacht swept past a dipping spar buoy, from which a pair of gray gulls rose with screaming protests and headed for the land.

We were all on the forward deck now, watching the houses of the town and trying

LEVIATHAN

to mark the shipyards. Aloft, the crew were dressing the yacht in a riot of signals; strings of yellow, red, and blue bunting flung in flying festoons from every spar tip, each flag snapping free in the steady breeze. The houses of the town grew larger; two church spires appeared, thin and lofty against the sky, and a long streak of yellow, on a little headland, evolved into a sprawling summer hotel perched high above the breakwater.

"There she is!" some one shouted.

High above the houses by the water's edge a black bulk loomed upward. There were masts above; masts and the flutter of flying flags. It was the new ship upon the ways.

The harbor was cluttered with vessels. A dozen dingy schooners, like shabby gulls, swung at anchor against the tide. Tugs and fishing-boats swarmed in a wild disorder.

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White excursion steamers, their decks slanting with passengers crowded on the shore rail, lumbered up and down the harbor, paddle-wheels frothing against their sides. Power dories and boats and launches sputtered recklessly back and forth, their unmuffled engines exploding in irregular volleys as they half swamped in the swell from every passing boat. From the shore came the intermittent blare of a brass band; now a few clear notes and then a silence as the music was blown back by the breeze. And above all the noisy uproar of the harbor, the great, six-masted schooner lifted its smooth, black sides from the shingled buildings that seemed to cling like barnacles to its keel.

From the shore came the sharp strokes of axes and hammers. A police-boat officiously rocked past us. "Keep back of the lines," shouted an excited man through a megaphone; "she'll swing this way." Grad-

LEVIATHAN

ually the tugs and steamers drew back into line; before them a great square of open water shimmered in the sunlight.

"She's off!" shouted the mate.

Motionless the great ship seemed to cling to the ways. There was a lull in the wind and from her after-deck came a few blaring bars of "The Star-Spangled Banner." Above the heads of the players an American flag lazily coiled and blew open from the peak.

No one but the mate saw her start, but suddenly I realized that with constantly increasing speed the towering ship was gliding down the ways to the water's edge. A roar of many voices, the brazen clamor of the band, shrieking whistles, and the detonations of yachts' cannon seemed to quicken her speed. From the shadow of the smooth, straight keel puffs of gray smoke fanned up against her sides, for the friction had ignited

AMERICA AT WORK

the grease-soaked blocks beneath her. Faster and faster, stern foremost, she swept to the sea. With a dull roar she reached it and, half submerged by her plunge, the stern buried itself in the water and a white wave curled up around it. Like a swimmer breasting the surf she reared up again, and again plunged with a pitching motion; again and again, each one growing fainter, until at last she rode smoothly, in the middle of the harbor, her long black body swinging against her anchor chains and the two tugs which held her.

The launching was over and another ship had begun her brave life. Perhaps she might be the last giant of her kind. Steel plates and smoking funnels have replaced stout oak and widespread canvas. I thought of the days when every harbor was a shipyard, when great clippers raced back with tea-packed holds on record runs from

LEVIATHAN

Shanghai and Hongkong to New York; records that stand to-day.

Outside of the harbor we met a dingy tramp steamer, light-laden, her rusty plates unpainted, her propeller threshing half above sea. From her black funnel a cloud of smoke trailed far astern. Here was the conqueror.

Two years later I read of the abandonment of that great vessel I had seen first greet the sea. She was impracticable, they said; too many men were needed to work her sails; soon the great masts were to fall, and the decapitated hulk, filled with oil, was to be towed by tug from port to port.

V

HIGH TENSION

THE purple blackness of the sky was misted with a myriad stars, faint coruscations which illuminated the night with a dim radiance. Against the stars rose the black silhouettes of the hills, and between them the broad river was faintly visible, an expanse of silent blackness that glistened here and there like polished marble in the starlight.

The watchman came limping down the parapet, his lame foot scraping on the concrete floor.

"Better take a look at the dam," he shouted; "ain't often you see water going over this time of year."

Like a half-strung bow the long dam

HIGH TENSION

curves its slanting concrete wall from cliff to cliff across the valley. At one end, piled up against its smooth white face in an angle with the cliff, the power house braces its broad back squarely against it: a great concrete building, its topmost story alone appearing above the crest of the dam. And through the latticed grills, from the deep reservoir of the valley above, the silent water discharges, whirling, reeling, and staggering under the mighty pressure, into the deep-lying turbine chambers, whence it finally emerges in a roaring but shattered torrent from the draft tubes beneath the firm-planted feet of the building.

In the dim starlight and the gleam of the lantern, the river stretched limitless in the darkness, but following the edge of the dam, the smooth surface seemed ripped open as though by a keen blade, and a long curl of foaming white marked where the crowding

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water leaped its barrier and fell gleaming to the bed of the river below.

“Do you have much trouble with the ice in winter?” I asked, as the watchman stood with his hand on the door which leads from the dam into the power house.

“No, it ain’t so bad. Pretty seldom that the ice gets bad in the forebay.” In explanation he waved his arm at the basin directly behind the power house. “It’s all protected with a boom of logs so that the ice and floating stuff won’t jam up against the grills. It’s down there in the power house where they have the trouble; there and out on the transmission lines.”

For a minute we stood in the doorway. As though wiped clean from the sky the stars along the horizon had disappeared and only above were they still shining clearly. Then for a second distant lightning flickered behind the hills, sharply defining

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the outline of trees against a cumulus of clouds.

“Guess you’ll see some fun if you stay late enough to-night; there’s a storm up river, — that’s where three of our transmission lines go, up to Bolton.” He pushed the door open and we entered the top floor of the power house. On a steady wave of heated air came the roar of machinery and smell of oil. A long flight of stairs, beyond another door, led sharply down between smooth, white walls of concrete to several floors below. Halfway down, the lights on a landing shone brightly, and at the foot a glare of light sharply outlined the square opening to the stair well.

From the landing I glanced about me. A long room brilliantly lighted occupied the entire floor of the building. Down the center and along the walls extended rows of stone shelves and alcoves. Here were the

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giant oil switches which opened or closed at the touch of the operator on the switchboard gallery on a floor below, loading or clearing the transmission lines of an electric current sufficient to light and turn the wheels of distant cities. On shelves gleamed the heavy copper bus bars, switch sidings where the current pulsed from the generators and without a pause surged out a hundred miles.

“Ain’t no place to visit,” said the watchman. “There’s seventy thousand volts on them bars, an’ if you get too near it will jump at you; enough to kill an elephant, an’ you’d never know what hit you.”

At the foot of the stairs the air fanned hot in our faces and the scream of the generators rose shrill and deafening. We were standing on the switchboard gallery, a curved balcony which clung to the wall of the generator room twenty feet above the

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floor and midway to the roof. Below in a long line the great generators filled the smooth stone floor.

“Well, guess I’ll have to leave you,” said the watchman. “Through for the night. Shake hands with Mr. Fogarty, he’s night operator, he’ll show you the rest.”

The night operator, a spare young man in clean overalls and a blue shirt, led me to a chair beside his table.

“Here’s where we direct things,” he explained, “kind of hard to hear if you are n’t used to the noise, so you can watch and I’ll tell you all I can. There’s a bad electric storm up the valley and we are liable to be pretty busy here for a few hours.”

Along the back of the gallery a multitude of white-faced dials with quivering indicators were set in high panels of marble, below them the handles of the controlling switches.

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There was a sudden, palpitating light beyond the windows and fast behind it a rending crash of thunder like the snap of an iron girder. At the same minute the telephone in a booth beside the switchboard rang shrilly.

“Lightning struck one of our transmission towers about thirty miles from here!” shouted the operator as he dashed out of the booth and began to work at the switchboard. “I’m cutting out that line so that the repair crew on the section can straighten things out.”

He was telephoning again, telling his men that the line was dead and safe. Outside, the storm was breaking in full force, and the trembling light through the tall windows disclosed the black hills and the river like the reeling film of a cinematograph. A blinding flare seemed to blast the windows and with it came a terrific crash of thunder.

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“Another line’s gone,” he shouted; “that one hit mighty near here. Did you hear it scream?” On the board there was a flickering of the needles on several of the dials. Again came the telephone; a minute at the board, and again he answered. “We’re in bad to-night,” he called to me. “This has n’t left me much to work with, but we’ve got to keep things going.”

From far below, and at times rising above the note of the generator, came a deep booming, a bass note that tuned with the wilder song of the machines: it was the roar of the tailraces where the water thundered down from the turbine chambers through the draft tubes to the bed of the river.

For a long hour the operator moved slowly back and forth before the switchboard. Now and then the telephone jingled and short messages were given and re-

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ceived. Over his shoulder he threw to me occasional explanations, strange technical sentences filled with incomprehensible phrases: ~~synchroscopes~~ ^{synchronoscopes}, electrolytic arresters, picking phases, and getting the generators in step again. Then came the message that repairs on one of the sections had been made.

The strain was over and he dropped limply in a chair beside me.

For a minute I watched him. "Mighty little the people in the cities know," I said, "when things go wrong."

He laughed a little. "No, and, friend, to-night's nothing; why, some nights we have trouble."

VI

FIRE-DAMP

IN the soft, yellow glow of his safety lamp, Campbell peered into the blackness of the tunnel. On either side a long row of props, chalked with fungus growth, and bending under the weight of the low roof, stretched out beyond the dim lamplight and disappeared, and behind them the rough walls of coal glistened like broken glass. There was no sound, but the steady pressure of the air current, dry and pungent, seemed to carry a vibration that sang softly in his ears. Then from behind him came the noise of feet, clumping over the coal-strewn floor of the tunnel.

“Any gas in Number Six?” Campbell shouted, without turning his head. The

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words were sharp and clear, but there was no echo. Still peering ahead into the blackness he waited until the sound of the man's feet grew louder, and a faint increase in the yellow haze of light told him he was standing beside him.

"No, it's all clear in Six." There was an uneasiness in the voice, and Campbell turned and looked down into the sharp, thin face of the mine inspector.

"Well, let's go ahead." Slowly they walked into the blackness, over the uneven floor, and slowly as they advanced the faint light of their lamps, for the brief moment of their passing, disclosed the gleaming walls of the tunnel, the low roof, the track cluttered with broken coal, and monotonous files of white-splashed timbers that melted into blackness behind them.

"She's back in Paris entry," said Campbell. He was a large-framed man with fair,

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uncut hair that curled slightly beneath the bottom of his blackened pit cap; over his strong, white teeth a drooping yellow mustache, heavy with coal dust, half hid deep-creased lines about his mouth. Twice in the three long months that had just passed "She" had swept resistless through the miles of tunnels, — a wave of rending and scorching flame, which burst into being when perhaps some latent spark from the fire which had long ago closed the mine, or a defective gauze in a safety lamp, had ignited the explosive mixture of air and gas which completely filled the "workings." To them "She" was a creature, an indescribable something, a terrible personification of death and destruction; and in the silent places of their hearts they feared her.

"She ain't going to let go again," said Campbell. "It was n't fire set her off last time. It was Johnny Cashay's lamp

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touched her off. There must have been a hole somewhere in the gauze."

"Sam!" They stopped and listened, and Campbell moistened his finger and held it high above his head, close under the roof.

"The air's moving good; Five will be clear of gas in an hour, and we can explore up to Four. Do you smell nothing?" They sniffed the dry air which blew softly past them.

"I thought I smelled smoke," said Campbell. For a second they were silent.

"Don't get it," the other man answered.

Ten feet ahead of them lay a dinner bucket beside the rails, where, long ago, on the night of the fire, some miner had dropped it in his flight. The cover had fallen off, and the half-spilled contents was beaded with the white crust of decay. Campbell kicked it with his foot, and the mass rolled out into the ditch.

FIRE-DAMP

"Never did get to eat his banana," he said.

At regular intervals they passed the black openings of tunnels that turned off from the main entry. Once they walked a few yards up into one of the cross tunnels, but a sharp pointing of the tiny yellow flames in their safety lamps warned them of the presence of gas, and they stumbled back to the main track and continued.

"What's the time?" Sam fumbled in his pocket, and distinctly they heard the clear, metallic ticking of the watch, as he held it up in the lamplight.

"Pretty near noon."

"We'll go back, I reckon. Can't go much further now, but by two the air ought to clear it out enough so we can get to the heading."

For ten minutes they tramped silently back along the rough track, and then turned

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sharply to the right. One hundred feet beyond was the foot of the hoisting shaft. For a brief second they stood and sniffed the air.

Suddenly, far off, like distant thunder, came a sound from the recesses of the mine.

"My God!" screamed Campbell, "she's let go!"

In a panic of fear they dashed a few yards into the cross cut, and flung themselves, their faces buried in their arms, on the tunnel floor. Steady and unwinking one of the safety lamps gleamed where it had fallen. A heavy vibration trembled on the air. The far-off thunder boomed louder and nearer; a wild tumult of sound shrieked down the entry; and a cyclone blast of wind, black with its pall of coal dust, spun them like dead leaves far into the cross cut. Fast on the wind, like an unleashing of Hell, came a wave of flame, blanketed in

FIRE-DAMP

pitchy smoke: flame incandescent with light and heat: flame that scorched the gleaming walls of coal into blackened coke, and brushing with its fiery touch the oak beams and props, blackened and charred them in the brief moment of its flight.

From the distant entries through which it had passed the roar of the falling roof was lost in the thunder of the flame wave, as it hurled itself on its course through the mine galleries to the shaft mouth.

In the blackness and sudden silence that followed, Campbell lifted himself to his knees. The lamps were extinguished; and the burned-out air seemed thick with intense heat. Groping in the blackness he crawled until he encountered the walls of the cross cut, and then, turning, followed it, reaching out to touch it after each convulsive effort. Once he stopped for a long minute; it was Sam, and he knew that he

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was dead. A sudden animal fear of death, a tremendous mustering of every nerve and sinew to resist, seized him. In the vitiated atmosphere and in utter blackness he continued. Something seemed to flicker like electric flashes before his eyes, and softly he sank down between the rails. For in from the far tunnels of the mine poured the poisonous after-damp: the deadly gas which follows an explosion.

VII

SKYSCRAPER

THE old brick building had vanished before the wreckers in a cloud of broken brick and plaster. From my window I could look down into the cavity which had held it. Already the muddy floor was dotted with the toadstool tents of the excavators, and day and night unceasingly wagon-loads of sticky clay and mud dragged up the incline to the street. Far down in the stifling air of the caissons the concrete roots were being planted, tied with cement and steel to the very core of the world.

The foundations were finished and the first thin steel columns stretched upward. In a day they multiplied. A hundred black

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shoots pierced the soil; a hundred sprouting shoots, in even rows, like a well-planted garden. In ordered plan the crossbeams fell into their places, and the great lattice of the substructure shaped itself. Then, above the uproar and vibration of the street, rose the angry clatter of the pneumatic riveters, steel against steel in a shattering reverberation.

With incredible rapidity the gaunt frame piled upward. On the topmost story the derricks crouched like giant spiders, thin legs firmly braced against post and I-beam, casting their threads of steel softly to the distant street to take a dozen tons of girders in their grasp and lift them, gently turning, to the top. Against the pale sky the black ribs of the building surged higher. As through prison bars I saw the distant blue of the harbor; the familiar view had vanished; a miracle had transformed it. Un-

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tiring, hour after hour, the derricks lifted bales of steel to swing into their destined place; and as each new story was bolted down the derricks lifted themselves heavily to the new level, clean cut against the sky, above the highest towers of the city.

Like beetles the steel-workers clambered surefooted over the empty frame. Far out on the end of narrow beams they hung above the void; on the tops of slender columns they clung, waiting to swing into place a ton of steel. Braced against nothing but empty space, they pounded red-hot rivets with their clattering hammers; like flies they caught the slim-spun threads of the derricks and swung up to some inaccessible height. On flimsy platforms the glow of their forges blinked red in the twilight.

I am thinking also of other workers: of men who measured this tall tower on their

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slide-rules, of grimy workers who followed their mystic blue-prints and made each piece with such fine precision that the great masses of steel fell softly into their final place with hairbreadth accuracy, rivet-hole to rivet-hole, and tongue in groove. Engineers, who foresaw each bolt and fitted so perfectly mass on mass with only imagination and their books of figures to guide them; workers in the steel mills of the distant city who moulded each beam and pillar to go together like a watch, — theirs is the silent forgotten labor!

Day faded in fog and darkness. Black-blurred, the frame of the skyscraper rose in the gray of the mist and the shadow of the night. Through the tangle of its skeleton frame the flaming red and yellow of an electric sign spattered a trail of jeweled fire against the sky. Another, with a flash of myriad color, shone and was gone. Far,

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down in the streets the glare of automobile lights stroked the gleaming blackness of the pavement. From surrounding buildings the glitter of countless windows shone brightly through the mist. But high above the fire-fly activity of the city the black frame of the skyscraper touched the starless sky. Like beacon fires the forges of the workers glowed intermittently, panting breaths of red, half smothered in the approaching night. In graceful curves, like tiny comets, the heated rivets, tossed from forge to the waiting bucket of the riveter, gleamed yellow and vanished. I thought of Whistler's nocturnes; of the fireworks at Cremorne.

I stood on the rough staging of the top floor of the tower. Above, the light steel ribs of the dome met in a heavy rosette from which a flagpole pointed to the drifting clouds. Standing on its base a man was arranging the tackle which would lift him

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up the slender mast, to paint it, or gild the ball at its tip. He saw me and leaned down.

“Come up,” he shouted.

I climbed the ladder and, with his arm to steady me, crawled out above the dome. There was room for my feet beside his. I heard him laughing beside me.

“Don’t break off that pole, I’ve got to climb it.”

I looked down. The curving ribs of the dome ended in a shallow cornice twenty feet below. That was all. Far down the roofs of neighboring buildings lay flat and small in the sunlight. Like the great black matrix for a printed page the roofs and streets extended to the harbor and the hills; like column rules the shallow grooves of avenues cut sharply the solid lines of the side streets. Here and there were the open spaces of public squares; far off, the green sweep of a city park. And everywhere

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above the roofs wisps of steam and smoke lay softly on the breeze. Like crooked fingers the wharves caught the edge of the harbor; the water was a quivering green, dotted with toy boats that crossed and re-crossed like water-insects, leaving a churn of white behind them and a smear of smoke above.

Straight down in the street the cars crawled jerkily in two thin lines, the beetle-backed roofs inch long in the distance. And everywhere were the moving dots of people, swarming upon the pavement.

It was very still. Far below, the noises of the street, the living cry of the city, rose like the murmur of a river in a deep cañon. Beside me, the steeple-jack leaned easily against the mast, his eyes watching the distant glimmer of the sea. I looked up and the slowly moving clouds seemed

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suddenly to stand still, the tower took up the motion, and racing across the sky, the flagpole seemed bending to the earth.

Down in the street I joined the crowd on the sidewalk, necks bent back to watch a tiny speck at the top of the thin shaft of the flagpole.

“Pretty high up,” said some one.

“Yes,” answered another, “but they’re putting in the foundation for a higher one on the corner.”

VIII

DYNAMITE

ISOLATED and avoided, the high explosive plant lies half hidden in a waste of sloughs and sand dunes. Like the barren country that surrounds it, the plant itself seems a part of desolate nature, stunted and storm-beaten as the wind-swept hills. Against the straight line of the horizon rise no massive structures of steel or stone; no sound of man or machine breaks the soft stillness; no smoke clouds stain the blue of the autumn sky. Half buried in the rolling sand a hundred small green buildings scatter in wild disorder along winding paths among the scrub oaks. The voices of undisturbed wild fowl rise from the fens and marsh land.

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In the little office at the gate I left my matches and put on a pair of soft wooden-pegged powder shoes. Outside, the faint flavor of last night's frost freshened the morning air, and above the red and yellow of the scrub oaks the autumn sun was shining in a pale-blue sky.

At my side the superintendent was explaining the processes of manufacture I was soon to see, but my mind was curiously unresponsive; in the peace of the morning air an ominous presence seemed to surround me; an invisible force that needed but a spark or the slightest impulse to awaken it, annihilating and devastating in its sudden fury.

Beyond the office, like the letter "S" a high sand dune bent in a general east and west direction, a sweep of marsh land in each sheltering curve. Against the outer bank of its first wide crescent the small

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power plant and a row of red one-story buildings marked a single street. From the open door of the power house the rhythmic drone of a generator accentuated the stillness. Down a track between the buildings a horse plodded slowly over the worn ties, dragging a small flatcar, the driver leaning lazily against one of the uprights which supported a dingy awning.

The manufacture of dynamite consists of two separate processes, which are conducted individually up to a certain point, when their products meet and by their union the actual dynamite is produced. In the little buildings by the power house the first of these products was in course of manufacture. Here the fine wood dust, mixed with other materials, was prepared, an absorbent to hold the nitroglycerine which was being made a half-mile beyond the nearest sand dune. Packed in

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paper cartridges the nitroglycerine-soaked "dope," or sawdust, is called by a single name — Dynamite.

In two great open pans slowly revolving paddles were turning over and over a mass of wood pulp, fine and soft as snow. The room was warm from the sunshine on the low roof and the drying fires below the pans; there was a strong, clean smell of sawdust. The building was deserted; unattended the paddles swung noiselessly with the low sound of well-oiled machinery.

Inside the next building a couple of men were weighing great measures of white powder from bins along the wall. The superintendent picked up a printed slip from a desk by the window.

"Nitrate of soda, nitrate of ammonia, wood pulp, marble dust. That's the formula for this batch. Sometimes we put in sulphur, or flour, or magnesium carbonate.

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It's all according to what kind of explosive is wanted; what it's to be used for."

Far down at the end of the little street the strong, hot smell of paraffine hung heavy in the air. Inside, against the walls of the building, the paper cartridges were drying; racks of waxed yellow tubes half filled the building.

Here the first process of manufacture was completed. Stable and harmless, the fragrant wood dust was being prepared for its union with that strange evanescent spirit which would endow it with powers of lightning strength and rapidity.

With our powder shoes sinking in the sliding sand we climbed the path to the top of the hill which marked the center of the twisted dune. On its summit the frame building of the nitrater notched the sky. Here, in the silence between earth and clouds, a mighty force was seeking birth.

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Perched on a high stool, an old man in overalls bent intently over the top of a great tank, his eyes fixed on a thermometer that protruded from its cover. Above, a shaft and slowly turning wheels moved quietly in the shadows of the roof. There was a splashing of churning liquid, and the bite of acid sharpened the air. The old man turned his head for a moment to nod to us. Below his feet a coil of pipes white with a thick frost rime entered the bottom of the tank, a cooling solution to keep the temperature of the churning acid within the limit of safety.

As we stepped inside the doorway, the splashing grew louder; the bitter reek of the acid seemed to scorch my nostrils. Slowly the old man turned a valve beside him and a thick trickle of glycerine flowed heavily into an opening in the top of the tank. Inside the blackened caldron

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a strange transformation was in progress. Were the glycerine allowed to become completely nitrated by the acid the windows of the distant city would rattle in the blast that would surely follow. Carefully, the nitrating must be brought almost to that danger-point and abruptly arrested; so near, that later in the form of dynamite the nitrating could be instantly completed and the desired explosion obtained by the jarring impulse of an electric spark. Like a child pushing a dish to poise on the table edge the old man was bringing this dynamic mixture to a precarious balance.

The superintendent pointed to a cistern filled with water behind the nitrater.

“Before we had the brine pipes to keep the acid cool, it used to heat up occasionally. It gives up red fumes when it passes the danger-point. You ought to see the quick work Old Charley used to do, —

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open that faucet in the nitrater to let the acid and glycerine dump into the cistern and drown; blow the alarm whistle, and then everybody beat it!"

The old man looked up from the thermometer. "She's ready."

Deliberately he climbed down from the stool and opened a switch behind him; the splashing of the paddles ceased; the process was completed.

Behind the tank an earthenware faucet opened into a long lead gutter that passed out of the building. Fascinated, I watched him as he slowly turned the handle. From the spout a stream of viscous liquid gushed noisily and flowed off in a sullen current.

"Nitroglycerine," — the superintendent pointed his finger at the splashing stream; "of course, it's impure now, mixed with acid. We'll see it purified in the separating-houses."

DYNAMITE

I was disappointed. Vaguely I had expected something would happen; how could this dull, oily liquid be that fearful thing that had been represented.

“There’s enough in that trough now to wreck a battleship,” he added.

Under the crest of a curving hill a half-mile away, was the mix house. From the nitrater we had followed the nitroglycerine through the dangerous process of its separation from the acid, its perfect neutralization. Here, at last, the explosive fluid would assume its final form. Mixed with the absorbent dope, in a crumby consistency it would become dynamite.

The sunshine filled the little room with yellow light; a blue fly buzzed noisily against the window. Facing the flat marshland the building rested in a deep cut in the hillside; behind it the solid hill, on either side an artificial embankment or barricade

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of sand and timber. In the center of the room was a cumbersome machine like an archaic mill for crushing grain. Hung from an axle revolving on a perpendicular central shaft, two great wooden wheels, four feet in diameter, rested in a circular trough; a pair of giant cart wheels with broad, smooth tires of pine.

There was a sound outside the building. Down a board walk that disappeared behind a hill in the direction of the separating-house, came a man pushing a square wagon completely covered with rubber blankets, — three hundred pounds of nitroglycerine.

Swiftly the two workmen filled the circular trough with the prepared wood pulp. The wagon was trundled softly into the room. From a tank in the corner a measure of brown, sweet-smelling, aromatic oil was mixed into the contents of the cart.

Something was going to happen. A sud-

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den impulse to run before it was too late seized me. The cart was pushed beside the trough. From a hose in its base a heavy brown fluid gushed over the powdery dope. Slowly the steady stream became a trickle and ceased.

There was a faint sound and I knew that the current was thrown in; the great axle began to revolve on the shaft. One and then the other, the giant wheels turned heavily. Under the advancing ploughs the brown stain of nitroglycerine faded in the yellow of the dope. Round and round; heavily the smooth wheels pressed the flocculent mass, cleanly the sharp ploughs turned furrows behind them — Dynamite.

I started violently at the voice of the superintendent. It seemed hours instead of minutes since this death-taunting machine had begun; hours in which each second might bring annihilation.

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“It’s mixed.”

The wheels ceased to revolve. With wooden shovels the workmen scooped the dynamite from the trough and pitched it into fiber cans, as big as barrels.

As though built to withstand the siege guns of an enemy, the dugouts of the packers faced the marsh in a long straggling line against the hillside. Like the mix house, each building sank deep into the sandbank, its sides protected by enveloping barricades.

In each small cell two men were working. There was little talking. Silence hung heavy over the hills and marsh land; a strange blending of peace and terror that made harsh sounds improper and jarring to the senses.

With quick dexterity the empty paper tubes, that I had seen manufactured when I first began this perilous journey, were inserted in the packing-machine. An abrupt

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movement, and they were packed with dynamite and laid in boxes beside the workers.

I picked up one of the "sticks" from a half-filled box. "Stump Dynamite."

Hour after hour, day after day, the filled boxes were trundled down the board walk to the magazine. "Stump Dynamite." I had always thought of this great industry as a destructive agency, of high explosives as carriers of death and desolation. But where the forests have vanished before the axes of the woodmen, dynamite is clearing fields for the next year's planting. In the black entries of the mine the undercut coal-face falls shattered at the blast of the explosives. Through the walls of mountain ranges it is tearing loose the solid rock, that trains may some day follow the level rails; through blasted tunnels flows water to moisten the lips of a parching city; from ocean to ocean it has opened a giant cut

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that deep-sea vessels may carry their cargoes by shorter routes; deep under the strata of the earth's crust its sudden shock shakes the oil-well into life; its rending breath tears the red ore of iron from the living rock.

Labors of Hercules! What are the feats of the earthborn son of Jupiter to the mighty wonders accomplished by this tabloid thunderbolt. Death and destruction may come from its sharp detonation, but for every life that goes out in siege or battle a hundred lives are sustained by its quiet labor in field or mine.

The afternoon sun was setting behind a mist of autumn clouds. In the silence of the dunes and marsh the clear call of a bird sounded sharp and silver-tuned in a run of hurried melody.

IX

THE MILLS

FROM the car-windows, as the train crosses the arched stone bridge, you can see the mills piled high above the south bank of the river. Vast and dingy, the broken roofline notches high against the blue Minnesota sky. Like the battlements of some feudal castle, the stone and brick walls tower upward, here and there the square shaft of a grain-storage tank rising turret-like above the roofs. At the foot of the cliff, although the mills seem to rise abruptly from the very edge of the water, the river courses in bent and broken streams, diverted and trained in the harness of industry; through a hundred mill-races in thick black torrents; a white blue

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shimmer over the apron-dam across the river.

Gathering strength in every mile of its course, the great river, rising in the silent waters of Itasca to pour a torrent twenty-five hundred miles away into the Gulf of Mexico, pauses here for a brief minute to stroke into life the mighty turbines of the flour-mills. Above the dams that hold the river in check, the water, deep and silent, floods back between wide banks; below the tail-races of the mills it spurts noisily in a shallow bed, far down between high bluffs of weathered stone. But at the falls the mills, silent and apparently devoid of life or activity, mark the measure of its flow. And from that ceaseless flowing energy comes the power to grind the grain for a nation's bread.

Like a shelf against a wall the railroad tracks cling to the cliff. Above the clanking

THE MILLS

of freight cars and the mutter of the river, a vibrant murmur of myriad muffled wheels fills the shadow of the mills. Beside the tracks thin streaks of wheat gleam yellow on the grimy ballast. Here two great floods are meeting! From the flat reaches of the Dakotas, from the wheat lands of Minnesota and the rolling fields of Montana, from Manitoba, Saskatchewan, and the banks of the Athabaska, the tide of grain is at the flood. Unceasing, mightier by far than the "father of waters," one hundred thousand freight cars, fat and heavy with their rich lading, are emptying the season's harvest. And from the shipping platforms fifteen million barrels of flour go out each year into the markets of the world.

The freight cars are unloading. From the wide doors the scoops are pushing a stream of yellow grain. Like liquid it pours over the car-sills and down between the

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steel grills beside the tracks. Never has the touch of human hands defiled it. Born of the soil, it has been reaped and winnowed by the clean blades of wood and steel; never in the long process which will transform it into flour, will the touch of man's hand stain its perfect purity.

From bins below the tracks, endless conveyors were already gathering the grain in a long flow upward, up above the mill-roofs, far up to the tops of giant elevators, there to fall, a vast measured treasure, into the storage tanks beneath. With the assistant head miller, I climbed slowly to the top. The windows were misted with the dust of harvest, and even at that great height there was a fine powder of ivory flour on the floor and ledges. He pushed up a window. In the warm afternoon sunlight the mill-roofs lay below me. Far down beyond, the river, blue and sparkling, swirled

THE MILLS

in soft eddies about the dams and forebays. Beyond, the city stretched away to the rolling green of the low hills. And above was the blue of a cloudless sky.

Here, almost two hundred and fifty years ago, the captive Hennepin dedicated to his patron, St. Anthony of Padua, these falls where for so many years, in a cavern beneath, had dwelt that Great Unk-te-hee who created both man and earth. Gone is the guileful father of the Recollets; gone are the Sioux, whose tepees clustered about the cataract; gone even is that sheer leap of the river down forty feet, where now the low slant of the apron-dam smooths the water in its descent. The ranges of the buffalo are rich with golden grain. It pours through the grills beside the elevators. From the skein of mazing tracks the wail of a freight engine shrills loud and clamorous.

A conveyor was lifting grain from one

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of the tanks; on an endless belt it passed through a long high-swung gallery from the elevators to the mill. We followed to watch its progress. At the far end of the gallery the crawling belt with its steady rivulet of grain entered the top floor of the mill and disappeared in a ponderous machine. Above the roar of belts and wheels the miller called to me. His hand was filled with stones and nails and little flakes of wood, a heterogeneous mass of refuse. Here the grain was cleaned, all foreign impurities removed. Across the low ceiling, up and down, slanting at every angle, the "legs," long boxlike tubes through which the flour is carried from floor to floor, cluttered the great room. Down the center a battery of strange objects, bristling with rings of pipes like spokes in a row of rimless wheels, fluttered with unseen life. They looked like a misshapen organ, and I half expected to

THE MILLS

hear the notes of some strange music echo from the pipes. The dust-collectors.

On the floor below, the maze of the legs grew more bewildering. Here the purifiers were ranged in mighty companies, and the fine white smoke of flour tinged the air. Like soft snow it dusted my shoulders. The miller pushed back a slide in one of the machines; within, a reel of silk was slowly turning, and through its fine meshes the flour sifted continuously. He scooped up a handful and held it out to me. It seemed fine and white, but the grinding and purifying were only half completed.

Every machine was in quiet motion. But the mill seemed deserted. On the vast floors a few men wandered in and out among the machines. In the mellow half-light and the comparative stillness, unaided, almost unattended, these stolid workers of wood and steel performed their

AMERICA AT WORK

laborious functions. In the apparent confusion of a perfect system, all natural order seemed reversed: up a floor or two through the twisting legs, the flour flowed to the next machine, then back again, and again up to a higher floor. It was incomprehensible. The scheme was lost in the multiplicity of operations.

The monotony of the murmuring machines was suddenly broken. Wearied of only the silent turning of hidden wheels, a roomful of huge barrel-like creatures suspended between roof and floor had burst suddenly into impassioned life. Reeling and swaying like drunken dancers, the bolters vibrated with angry tumult. In their allotted places they dizzily shook their dusty sides, flinging madly about in a rotary motion.

The days of the big mill-stones have vanished; corrugated steel-rolls have usurped

THE MILLS

their places. In aisles, the roller-mills filled the floor, like stocky pianos in a salesroom. Between the fine teeth of the long steel rolls the clean grain flaked to flour. Here a series crushed the outer husk of the wheat berry; another battery ground fine the clean meal; and still others there were, each grinding finer and finer, endlessly. And between these grindings came the processes I had seen above, scouring, bolting, separating, and purifying.

Beyond the open doors of the shipping platforms long lines of freight cars were waiting, half filled with sacks and barrels of flour. Here at last was life and activity. In white caps and uniforms the millers were packing the finished product. Between high-piled sacks, trucks trundled noisily. The floor was white with flour. On slow-moving belts the filled sacks passed out from beneath machines which filled and

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weighed the contents to the fraction of an ounce. With long looping stitches the sewers fastened the tops.

Beside the door two huge mill-stones lay half buried in the earth. With the wandering father of the Recollets, they were already but memories of a mighty past. Behind the city the sun had set in a strong, clear, yellow light. Up in the mill-windows, electric lights were twinkling. The night run had begun. Ceaselessly, day and night, forever, to grind corn for a nation's bread.

X

TELEPHONE

THERE was a continuous sound of many voices; a steady cadence in which no individual note dominated; a hundred women's voices incessantly repeating brief sentences with a rising inflection at the end, each sentence lost in the continuous tumult of sound. In a long line, perched on high stools, they sat before the black panels which rose behind their narrow desk. Into the transmitters—hung from their necks—they articulated their strange confused chorus. And apparently without relation to the words they uttered, a hundred pairs of hands reached back and forth across the panels, weaving interminably a never-to-be-completed pattern on its finely checkered face.

AMERICA AT WORK

On the panels a thousand little lights blinked white and disappeared. Tiny sparks of ruby and green flashed and were gone. Untiring, the white stars flickered in and out, and behind them raced the tireless hands, weaving a strange pattern with the long green cords. And unbroken, unintelligible, the murmur of the girls' voices vibrated unceasingly.

Outside, under the gray sky of a rainy day, the life of the city was at the flood. Over slim wires, buried in conduits below the trampled street, or high strung, swinging in the rising wind, the voices of a thousand people told their thousand messages to waiting ears. A passing thought, perhaps, that you would have me hear; with a single movement you lift the transmitter from the hook beside you; white flashes the tiny lamp on the black panel; a girl's hand sweeps across the board and plugs in the

TELEPHONE

connection. Space, useless, is swept aside; though actual miles may intervene I am suddenly beside you.

Messages of business that can make or ruin, death, love, infidelity, appeal! Automatically, surely, she weaves back and forth across the panels. Clotho, Lachesis, and Atropos,—Parcæ of the switchboard!

Here is the throbbing pulse of the city bared and visible. Night is over; with rapidly increasing frequency the flashing drops of light indicate that the activity of day has begun. Every action must be expressed in words, and, bared and concentrated, that word-current of the city rises like a gathering wave. From ten in the morning to five minutes after, the tide is at the flood. The flicker of lights is dazzling; the girls' hands race dizzily behind their flashing summons. Business is at its height. But here on another row of panels the occasional flash of

AMERICA AT WORK

lights offers a curious contrast: this is a panel for a part of the residence district; from seven to eight in the evening its lights will glow with activity. Then business is over and the downtown panels will be darkened. Here is a visual shifting of scene and interest. Work over, the social engagements are made, and business is forgotten. There is a friendly gossiping along the wires.

Night has come, and a dozen girls watch the long, deserted boards. Like the occasional glimmer of a cab lamp late upon the street, the signals, one by one, flash and are gone. The world is fast asleep. Far down at the end of the panel a signal brightens. "Number please?" — "Police!" It was a woman's voice. From the card index "Central" picks out the street address which corresponds to the number, and the nearest station is advised of the call. Had the woman no time to finish her message? There is

TELEPHONE

another light burning on the panel. Already she is forgotten and the slim hands are making another connection. Police or doctor, — the night calls are laden with portent.

What interests the world to-day? Does something disturb the minds of men? The flashing panels answer. As surely as the sun will rise to-morrow will the increased throb of light betray the fevered interest of mankind. Five o'clock! usually there is a slacking up, but not to-day. Heavier than at the busiest five minutes in the whole twenty-four hours, come the calls for connections. Did the White Sox win their game? It is the final of the series. Who was elected? Politics to-day runs high. War? The troops are off; marines have landed! Strikes, fires, or the sinking ship; the racing hands weave faster; the steady hum of the girls' voices accelerates almost impercep-

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tibly. Here beats the pulse upon the surface; they know its normal rise and fall; by its fevered beat they can read diversion or disaster.

Back over the years the superintendent recalled the various events which had been dramatically visualized on the switchboard panels. Twelve years ago, about; the panels were fewer then. It was almost five o'clock in the afternoon; in a quarter of an hour the day operators would be leaving, tired from their long labor at the board. The lights were flashing slowly, perfectly recording the slackened beat of business. Five minutes to five, — a wave of white light seemed to flare across the downtown panels, suddenly, unexpectedly. Ignorant of the cause, the girls plugged in the desired connections. Every one seemed to be calling out to the residence sections. For a brief minute there was a pause — The

TELEPHONE

flood of light was gone as abruptly as it had come. Then like a flame across the residence panels gleamed the signals, calling back, a hundredfold, back to the stores and offices.

The men had heard first the terrible rumor. Their messages across the wires to their homes had sought the answer to their first thought that she, that they, were safe. And then back, in anguished women's voices, came frantic appeals for names of the missing. For long hours through the night the white-faced girls held to their posts; and in their tired eyes the signals burned feverishly. That night Chicago shuddered in its grief, — for in the flames of the Iroquois Theatre, at a holiday *matinée*, had gone out the lives of countless women, men, and little children.

XI

FROM A THOUSAND HILLS

IT was two o'clock in the afternoon, but already the gray sky of a raw March day seemed to carry a somber twilight. A west wind filled the heavy air with the smoke and grime of the city, a dark pall through which shone dimly the lights in the office windows. Dearborn Street, black with melting slush and congested with noonday traffic, roared its deep, masculine monotone, the clangor of street cars and the shrill whistles of the traffic policemen rising in higher harmony sharply above the steady resonance. To the east, beneath the black structure of the Elevated, the lake gleamed a white square at the street end, cold and cheerless.

FROM A THOUSAND HILLS!

Five miles from the business district, a deserted tract in the center of the crowded city, lie the stockyards. Beyond the wide gate a road stretches indefinitely into the distance. On either side, above the high fences, rises here and there the irregular mass of great brick buildings, breaking defiantly the perfect level of acre upon acre of fenced inclosures. As I entered the gate a couple of men on horseback, riding with the ease of cowboys, galloped past me; their boots and silver spurs branding them just in from the plains with a trainload of cattle.

In the office of the packing plant, lights were burning. Behind a desk a man nodded at my request and called a guide, and together we passed through a door in the far end of the room. Low, heavily timbered roofs, floors soft with sawdust, and the yellow gleam of occasional incandescent lights shining dimly in the gloom of the building

AMERICA AT WORK

seemed suddenly to fill me with a sense of vast, uninhabited places. We stopped for a minute before a long table piled high with hams and slabs of meat. Two men were working behind it; silently, swiftly, and automatically. With the regularity of clockwork a thin, small-featured man stabbed each piece of meat as it passed before him and sniffed at the sharp steel skewer as he drew it forth. At the end of the table his companion, a great German in a white linen suit, branded the smooth black slabs on a white-hot die which gleamed from the table top.

"That's the government inspector," explained the guide; "smells every piece. He can tell with his eyes shut if anything that ain't A number 1 comes by."

Slowly we climbed the slippery stairs to the fourth floor of the building. At the stairhead some high windows swept the

FROM A THOUSAND HILLS

acres of yards below them. Almost as far as the eye could see extended, like a giant checkerboard, the streets and avenues of pens and inclosures. In smooth curves, railroad tracks twisted and bent with a glint of worn steel rails. Far off a locomotive shot suddenly a burst of white steam against the sky and the long train of cattle-cars behind it clanked into life. In the pens there was a restless moving of the backs of countless animals as they wandered back and forth from barrier to barrier, a constant motion that seemed to make the whole yard eddy like the shifting surface of a dark-brown sea. A confused sound of shuffling hoofs and doleful lowing hung in the air, and above all that great sea of life rose pungent the smell of a myriad animals.

From the pens below a long string of cattle moved slowly up an inclined roadway

AMERICA AT WORK

against the side of the building, which in gradual ascents and planes reached finally the floor on which I stood. Behind the slow-moving beasts a half-dozen men, like yapping terriers, goaded them from the rear. Aiding in their own destruction they were slowly climbing to the slaughter-house on the top of the building, whence the meat would descend by gravity from floor to floor to be cured, packed or dressed, and finally loaded into the waiting cars.

There was a smell of warm, fresh blood in the slaughter-house. From a gallery against the wall I looked down over a wide room dim in the pale glow of scattered lights. The cement floor was black with water and darker streaks, and the rubber boots of the workmen glistened in the wet. There was a clatter of hoofs and the shouts of men. Into a long, narrow pen on the far side crowded a score of steers, dazed and

FROM A THOUSAND HILLS

stumbling on each other in a panic of fear, their nostrils dilated at the smell of blood. On the platform above the pen the men ran back and forth, separating the cattle until they were evenly distributed into a long line. Then gates were lowered and the pen became divided into a dozen compartments. Along the platform two men with great sledges advanced from pen to pen. A long, clean swing of mighty arms, the dull knock of the sledge against a skull, and at each stroke a steer crumpled with a clatter of hoofs and disappeared. In a minute it was ended; the front side of the pen was lifted and the great limp bodies were dragged out with chains and tackle.

In the five minutes which followed a dozen men with long, thin knives stripped the hides, hoofs and entrails from the steaming bodies. Almost before I realized it, it was over; a man with a hose was washing

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the floor; the slaughtered carcasses were being wheeled away, and into the pen another bunch of cattle were crowding and sniffing the heavy air.

It was night when I left the building. Against the low clouds the sudden flares of light from the open hearths of the steel mills gleamed like summer lightning. As I walked out through the gate into the glare of the crowded street there came from the darkness behind me the low, far-off wail of a steer, and then, faint and distant, another answered it.

XII

CONCRETE

ACROSS the street the vast frame of a concrete office building is climbing steadily skyward. Reinforced with rods of steel and lacing wire the gray white stone seems endowed with a strength and permanency for all eternity. Each week the confining boards that mould the concrete are stripped from the topmost story and a new section is revealed; above, the scaffolding and moulds are replaced and I watch and wait for the next disclosure of its steady progress.

What is this substance that has enabled men to mould, in monolithic form, structures which defy the wearing touch of passing years; what is this man-made stone that

AMERICA AT WORK

until to-day the ages only have been able to produce? The roots which bind the building to the bedrock are made of it; the building which lifts its mass above them is born of it; street and sidewalk in the crowded city, the dam which checks a mighty river in its course, and the humble cattle-trough in the farmer's barnyard are moulded perfect from its mutable substance. Plastic, tractable, it flows into the waiting moulds to solidify, in forms that only years of patient labor with natural stone could produce. Flawless and beautiful in form and texture it lends itself to a thousand purposes. An age of concrete is at hand.

Like giant train-sheds the buildings of the cement mills loom, half hidden in a cloud of dust that drifts and eddies like snow about the roofs, low-lying between earth and sky.

CONCRETE

Beyond the gateway, the buildings divide into two main groups separated by a sweep of open ground. There is no sign of life; no sound except a distant rumbling like the grinding wheels of the freight trains beyond the gate. As though shod in flannel my feet sink softly in the dust; already my clothes are powdered with it, a dull, gray, impalpable dust of infinite fineness.

The interest in this vast industry lies principally in the future uses of its product. Its transmutation from the living rock of incalculable ages to a form which may be reverted to an adamant consistency, guided and controlled, is simply a long series of heating and grinding processes that are striking chiefly for the tremendous nature of the machinery involved. In the gloom of the buildings a disintegration of the very bone of the earth was in progress. From a slender trestle behind the mills

AMERICA AT WORK

strings of cars cast down a clattering shower of broken stone, fresh from the quarry's deep incision; and on the loading platforms the finished cement was being loaded into box-cars — cities in sacks and barrels.

The roar of grinding stone vibrated in the air. Through clouds of motionless dust occasional lights gleamed dully, like ship's lamps in a fog. Almost ankle-deep in places the cement covered the floors and rested in soft mounds on stairsteps and girders. Far off in the semi-darkness the shapes of men appeared and were gone.

Before me, stretching entirely across the width of the building, the first of a long line of drying-kilns blocked my passage with its giant body. A dozen feet in diameter, it rested at a slight angle, one end lifted a few feet above the other. Rumbling dully, below the shrill clatter of the grind-

CONCRETE

ing rock, they revolved slowly on their carriages, while through their intensely heated interiors a torrent of broken stone tumbled over and over in gradual descent to the openings in their lower ends. At the base of each kiln a jet of flame gleamed a warm cherry through the dust as it shot its incandescent stream into the base of the revolving tube. Cold and lifeless the broken stone poured into the upper end from the crowded hoppers; white with heat it tumbled, a piercing, gleaming torrent from the base of the kiln.

Cooled and blackened the dried stone passed on from the drying-kilns to the crushing-mills, steel monsters that ground it to powder with a clanking reverberation.

High above the kilns, on a great platform beside the storage hoppers, the crushing-mills that I had heard since I first entered the building stretched off into gloom.

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As though seized with a frenzy of labor, they writhed and shook in an excess of motion; black Cyclops beating the very rock to dust beneath their iron-shod feet. Loud as I shouted, my voice was lost in the smashing roar of their foot-beats; my body quivered with the vibration of their agonized labor.

Blended with the powder of other stones in the mixing-hoppers, the endless stream passed on to the tube mills, where pebbles of flint beat it to a finer consistency. Like gray flour, the endless belts bore it in a slender stream to the waiting bins.

In the burning-building another battery of kilns like those in the drying-room withered the powdered dust to clinkers. Above me, the black bellies of the kilns, reaching from wall to wall, turned slowly with a steady motion, great cylinders of steel revolving gently between giant fingers. Red

CONCRETE

through the dust burned the light of the flame blasts at their bases. Through blue glasses I peered up into the slanting tube, — as the burning tunnel of a mine it seemed redolent with heat and flame.

In the finishing-mill were repetitions of previous processes by which the clinker was resolved again to the fine powder of the finished cement. Like millers, white with flour, occasional workers passed among the machines; but it is not men that I remember, rather a feeling of their absence, — an impression of vast machinery automatically and ceaselessly performing its perfect functions.

Even the sampling had been reduced to an automatic process. Fascinated, I watched a slender arm of steel that dipped at perfect intervals a sample from a moving belt, lifted it high, swallowed it, and paused, waiting the moment for a repetition of the

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act. Somehow, through that slim arm, the tiny handfuls of cement passed out in regular order to the laboratories in a distant building, where with scales and test tube the destroying touch of centuries was concentrated in a few days or hours of grueling test.

From the storage building the waiting cars were being loaded with sacks and barrels of cement. For ten thousand years man has toiled to build for perpetuity. Rotted and gone with the dust of ages are the temples of antiquity. The great blocks of the pyramids stand in their places defaced and worn by the winds of centuries; stone alone endures. But in these sacks and barrels rested a new and magic substance, the stone of the future ages; no blast or chisel is called upon to cleave it; in its fine texture will be none of the imperfections of the natural parent; no crack or flaw

CONCRETE

will break its even texture. Nor is strength or skill required to mould it to its everlasting form. Firm rooted to the ribs of the earth it will carry the weight of lofty monoliths; through its smooth base new rivers will bear water to the city's mouth. Beneath sea and land, on the lonely farm and the crowded city street, this mutable substance has proved its right everlastingly to endure in imperishable concrete.

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